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IR spectroscopy with pyrolytic carbon string resonator as a tool for particle detection

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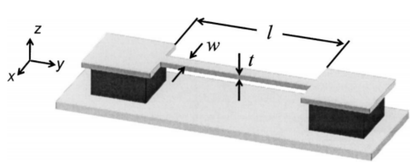
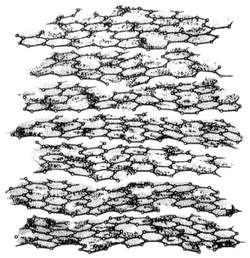
INTRODUCTION

MEMS String Resonator

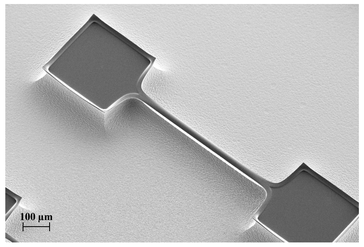


Pyrolytic Carbon

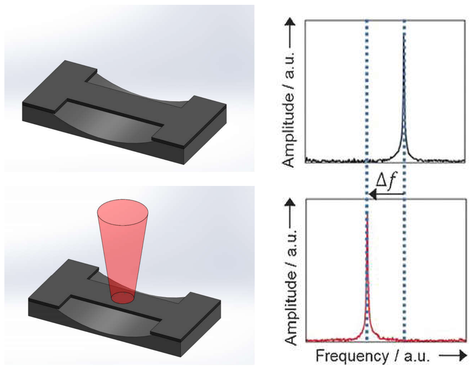


- Isotropic properties
- Conductive material
- Controlable properties

Pyrolytic Carbon String Resonator



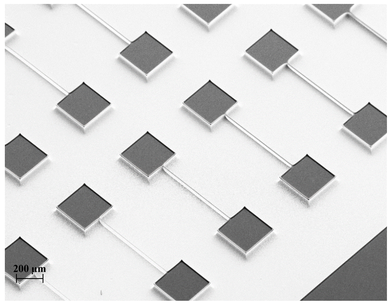
Infrared Spectroscopy



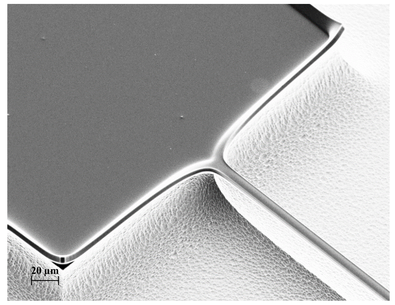
References:
S. Yamada, et al, Anal. Chem. 85, (2013) 10531-5.
M. Kurek, et al, Angewandte Chemie 56, (2017), 3901-3905.

RESULTS AND DISCUSSION

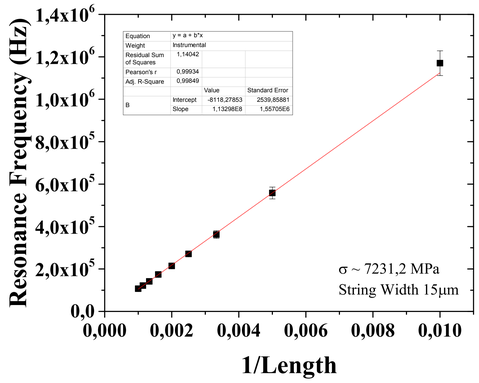
SEM image of pyrolytic carbon string



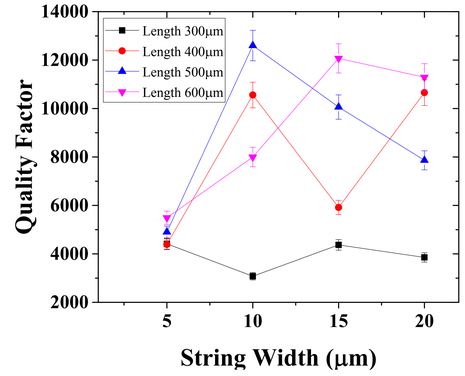
Length 500µm
Thickness 700nm



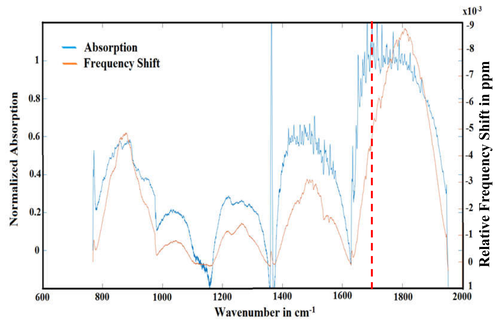
Resonance Frequency



Quality Factor

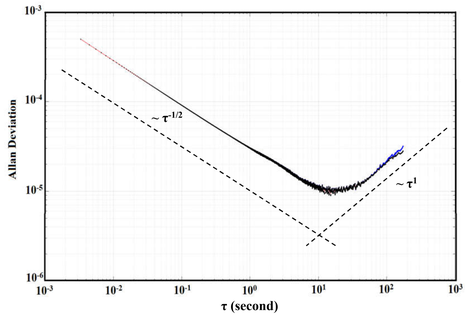


IR Absorption



An absorption peak at 1760cm^{-1}

Allan Deviation



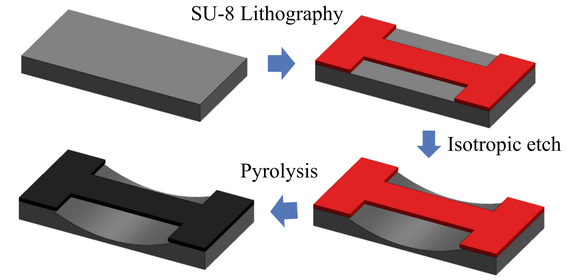
Minimum AD of 10ppm at 10 seconds

CONCLUSION

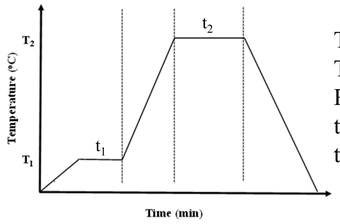
We demonstrate the fabrication of the pyrolytic carbon string resonators with optimized process. The carbon string resonators are then characterized by interferometry to obtain the resonance frequency and Q factor. A resonant photothermal IR absorption measurement shows the absorption spectrum of the materials. The results show the potential of the pyrolytic carbon string resonators as a tool for particle detection.

MATERIALS AND METHOD

Fabrication

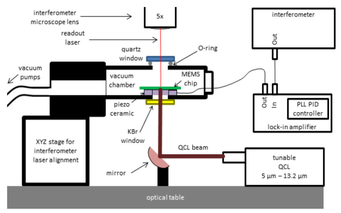


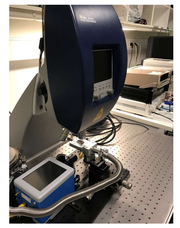
Pyrolysis process



T_1: 200°C
T_2: 700°C
Ramping rate: 2°C/min
t_1 : 30 mins
t_2 : 90 mins

Characterization





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